IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re **Patent** Application of:	)	
Hiroyuki NISHIMURA et al	)	Attn: Applications Branch
Serial No. Not Yet Assigned	)	Group Art Unit: Not Yet Assigned
Filed: July 9, 2003	)	
For: ENGINE EXHAUST PARTICULATE AFTER-TREATMENT SYSTEM	)	Date: July 9, 2003

INFORMATION DISCLOSURE STATEMENT

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

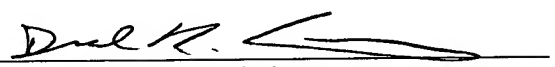
Sir:

In accordance with the duty of disclosure as set forth in 37 C.F.R. §1.56, Applicants hereby submit the following information in conformance with 37 C.F.R. §§ 1.97 and 1.98. Pursuant to 37 C.F.R. § 1.98, a copy of the document cited on the PTO-1449 Form is enclosed and described in the specification of the above-captioned patent application.

It is requested that the accompanying PTO-1449 be considered and made of record in the above-identified application. To assist the Examiner, the documents are listed on the attached form PTO-1449. It is respectfully requested that an Examiner initialed copy of this form be returned to the undersigned.

The Commissioner is hereby authorized to charge any fees connected with this filing which may be required now, or credit any overpayment to Deposit Account No. 19-2380.

Respectfully submitted,

By: 
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Partial English Translation of

JAPANESE PATENT

Publication No. 5-11205B

Page 1, right column, line 4 to page 4, left column, line 2

Detailed Description of the Invention

(Industrial Field of Utilization)

The present invention relates to a fine particle exhaust disposing device for a Diesel engine, and particular relates to a fine particle exhaust disposing device for a Diesel engine which is suitable for disposing fine particles (particulates) such as soot contained in exhaust gas.

[Prior Art]

In a vehicle in which a Diesel engine is embarked, a trap having a collecting material made of a porous ceramic material is arranged at an exhaust passage so as to collect fine particles such as soot contained in the exhaust gas. However, in such the trap, fine particles (particulates) are deposited as time goes by. Therefore, pressure loss of the discharge system increases with a result of loss of engine output unless the deposited particulates are removed. Thus, it is necessary to burn and remove the particulates to regenerate the trap at a certain timing when the particulates are deposited to some extent.

For the trap regeneration, a method has been conventionally employed in which an electric heater or the like is provided to burn particulates adhered to the collecting material.

[Problems that the Invention is to Solve]

For burning the particulates, however, the particulates are sufficiently heated in the above method even if the amount of deposited particulates is

less. Therefore, the collecting material fuses because the particulates are burnt as well even if the driving state of the engine transfers from a high load state to an idle state, that is, if oxygen is insufficient in the trap, oxygen is excessive due to a large amount of flow of the exhaust gas and the flow-in amount of the exhaust gas is less.

The present invention has been made in view of the above problem and has its object of providing a fine particle exhaust disposing device for a Diesel engine capable of preventing a collecting material from fusing even if the driving state of an engine transfers from a high load state to an idle state.

[Means of Solving the Problem]

In order to attain the object, the device according to the present invention includes: an oxygen concentration sensor that detects an oxygen concentration in an exhaust gas; a trap that collects particulates contained in the exhaust gas within an exhaust gas passage of a Diesel engine and burns the thus collected particulates; a trap temperature sensor that detects a temperature within the trap; and a control device that monitors each detection output of the sensors and controls an oxygen concentration of the exhaust gas introduced in the trap to be a predetermined concentration or lower if the temperature within the trap exceeds a predetermine temperature and the oxygen concentration of the exhaust gas exceeds a predetermined concentration when a driving state of the Diesel engine transfers from a high load state to an idle state.

[Working Example]

A preferred embodiment of the present invention will be described below with reference to accompanying drawings.

FIG. 1 shows a construction according to the preferred embodiment of the present invention. In FIG. 1, fuel is compressed and sent from a fuel injection pump to an intake system of a Diesel engine 10. The intake system includes an air cleaner 12, a turbocharger 14, a main valve 16 and a subvalve

18. The main valve 16 opens and closes an intake passage in association with the operation of an accelerator pedal 20, and the subvalve 18 opens and closes another intake passage having a smaller diameter than the intake passage of the main valve 16 by the operation of a control valve 22. Accordingly, intake air of an amount according to a depressed amount of the accelerator pedal 20 is supplied to the Diesel engine 10 through the main valve 16.

On the other hand, the control valve 22 includes two diaphragm chambers 28, 30 of diaphragms 24, 26 and allows a rod 32 connected to the subvalve 18 to slide by the pressure of the diaphragm chambers 28, 30. In other words, a negative pressure is introduced to the diaphragm chambers 28, 30 from a vacuum pump 44 through pipes 34, 36, vacuum switching valves 38, 40 and a vacuum tank 42. The vacuum switching valves 38, 40 open passages communicating with the vacuum tank 42 according to a control signal from a control device 46 to introduce the negative pressure to the diaphragm chambers 26, 30 of the control valve 22. When the negative pressure is introduced in the diaphragm chambers 28, 30, the rod 32 slides so that the subvalve 18 closes the intake passage thereof.

The exhaust system of the Diesel engine 10 includes a turbine 46 of the turbocharger 14 which communicates with a pipe 48. An oxygen concentration sensor 50 is provided in the pipe 48 for detecting an oxygen concentration in the exhaust gas, and a trap 52 is provided in the middle of a path of the pipe 48 for collecting particles contained in the exhaust gas and for burning the collected particles. The trap 52 includes a collecting material 54 for collecting particles and a distribution type heaters 56, 58 for heating the collecting material 54, wherein the heaters 56, 58 are connected to a relay circuit 60. When the relay circuit 60 operates according to a control signal from the control device 46, power from a battery 62 is supplied to each of the heaters 56, 58. A trap temperature sensor 64 is provided in the trap 52 for detecting a temperature within the trap, and a detection output from the sensor

64 is supplied to the control device 46. A bypass valve 66 is provided within the trap 52 for opening and closing an exhaust passage other than an exhaust passage in which the collecting material 45 is inserted. The bypass valve 66 receives the negative pressure from the vacuum tank 42, so as to open and close the exhaust passage according to the vacuum switching valve 68 operated according to the control signal from the control device 46.

An EGR valve 72 for controlling the re-circulating amount of the exhaust gas is arranged in the middle of the passage of a pipe that connects the downstream side of the trap 52 with the downstream side of the main valve 16. The ERG valve 72 opens and closes the passage of a pipe 70 according to the operation of the control valve 76 that operates according to the negative pressure from the vacuum controller 74. Namely, the ERG valve 72 opens the passage of the pipe 70 when the control signal from the control device 46 is supplied to the vacuum controller 74 to introduce the negative pressure into the control valve 76.

In addition, the Diesel engine 10 includes a water temperature sensor 78 for detecting the temperature of cool water in the engine and a revolution sensor for detecting the number of revolutions of the engine 10, wherein each detection output of the sensors is supplied to the control device 46.

The device of the present embodiment is constituted as above, and the operation thereof will be described with reference to the flowchart of FIG. 2.

When the control device 46 operates, it receives detection outputs of the sensor group that detects various kinds of values indicating the driving state of the engine and monitors the received detection outputs of the sensors. In order to judge whether the driving state of the engine transfers from a high load state to an idle state, it is first judged at Step 100 based on the detection output of the revolution sensor 80 as to whether the number of revolutions of the Diesel engine 10 is lowered to be not exceeding a predetermined number of revolutions. When the judgment results in YES at Step 100, it is detected

that the driving state of the engine transfers from the high load state to the idle state according to the lowering of the number of revolutions of the engine to a predetermined value or lower. Thereafter, the routine proceeds to Step 102 to perform judgment based on the detection output of the trap temperature sensor 64 as to whether the temperature within the trap 52 exceeds the predetermined temperature, i.e., 500C°. When the judgment results in YES at this step, the routine proceeds to Step 104 to perform judgment based on the detection output of the oxygen concentration sensor 50 as to whether the oxygen concentration in the exhaust gas is equal to or lower than 4%. When the judgment results in NO at this step, the routine proceeds to Step 106. The judgments at Step 102 and at Step 104 respectively result in NO and YES, the routine terminates.

At Step 106, fuel cut at deceleration is halted first as a step for reducing the oxygen supply amount to the trap 52. Then at Step 108, throttling is performed. In detail, the control signal is supplied to the vacuum switching valves 38, 40 to operate the subvalve 18, thereby performing throttling for closing the intake passage in which the subvalve 18 is inserted. Thereafter, the routine proceeds to Step 110 to perform judgment based on the detection output of the oxygen concentration sensor 50 as to whether the oxygen concentration in the exhaust gas exceeds 4%. When the judgment results in YES at this step, the routine returns to Step 108 again. Or, when the judgment results in NO at this step, the routine proceeds to Step 112 to release the throttling. In detail, the output of the control signal to the vacuum switching valves 38, 40 is halted to stop the subvalve 18 closing the intake passage. By performing the above processes, the routine terminals finally.

As described above, in the present embodiment, if it is detected, when the driving state of the engine transfers from the high load state to the idle state, that the temperature within the trap 52 exceeds 500C° and the oxygen concentration in the exhaust gas exceeds 4%, the fuel cut at deceleration is

halted and throttling is performed to reduce the amount of oxygen supplied to the trap 52, thereby restraining the oxygen concentration in the exhaust gas from exceeding 4%. Thus, the collecting material is prevented from fusing even if the heaters 56, 58 heat the collecting material 54 under the condition that the particulates are less deposited.

Further, the above embodiment describes the simultaneous performance of fuel cat halation at deceleration and throttling as a method for preventing fusing of the collecting material 54. However, the fusing of the collecting material 45 can be prevented, as well as the above embodiment, if the EGR valve 72 opens the passage of the pipe 70 to increase the ERG amount at the same time when the fuel cut at deceleration is halted.

[Effects of the Invention]

As described above, according to the present invention, if the temperature within the trap 52 exceeds the predetermined temperature and the oxygen concentration in the exhaust gas exceeds the predetermined concentration when the driving state of the engine transfers from a high loading state to an idle state, the concentration of the oxygen in the exhaust gas introduced to the trap is controlled to be restrained to be equal to or lower than the predetermined concentration. Thus, the collecting material is prevented from fusing even if the collecting material is heated under the condition that particulates are less deposited.

PTO/SB/08A (10-01)
Approved for use through 10/31/2002. OMB 0651-0031
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Substitute for form 1449A/PTO

INFORMATION DISCLOSURE STATEMENT BY APPLICANT

(use as many sheets as necessary)

Sheet 1 of 1

Complete if Known	
Application Number	Not Yet Assigned
Filing Date	July 9, 2003
First Named Inventor	Hiroyuki NISHIMURA et al
Art Unit	Not Yet Assigned
Examiner Name	Not Yet Assigned
Attorney Docket Number	740819-1019

U.S. PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	U.S. Patent Document Number - Kind Code[2] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Applicant of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear
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FOREIGN PATENT DOCUMENTS

Examiner Initials*	Cite No.[1]	Foreign Patent Document: Country Code[3] Number[4] Kind Code[5] *(if known)*	Publication Date MM-DD-YYYY	Name of Patentee or Application of Cited Document	Pages, Columns, Lines, Where Relevant Passages or Relevant Figures Appear	T[6]
		JP 5-11205 B2	02/12/1993			W/Abstract

OTHER PRIOR ART – NON PATENT LITERATURE DOCUMENTS

Examiner Initials*	Cite No.[1]	Include name of the author (in CAPITAL LETTERS), title of the article (when appropriate), title of the item (book, magazine, journal, serial, symposium, catalog, etc.)., date, page(s), volume-issue number(s), publisher, city and/or country where published.	T[2]

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